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REMARKS

Reconsideration is respectfully requested.

Claims 1-7 are pending in this application. Claims 1, 2 and 7 are amended. New claims 8 and 9 are added.

Claim 7 is rejected under 35 U.S.C. §112, fifth paragraph, as being a multiple dependent claim that depends on another multiple dependent claim. Claim 7 has been amended with the Examiner's concerns in mind to depend only on claims 2, 3 and 5, and new claims 8 and 9 are added which include the subject matter of claims 7/4 and 7/6.

Claims 1-7 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent 5,764,363 (Ooki et al) in view of U.S. Patent 6,018,392 (Tzu et al). Applicants respectfully traverse this rejection.

The principal structure of phase shift masks is a glass substrate (transparent substrate) engraving type phase shift mask because the conventional overlying shifter type phase shift mask has become incapable of meeting the demand for an improvement in the pattern transfer accuracy. The substrate engraving type phase shift mask exhibits favorable shifter fabrication accuracy and has a minimal phase difference deviation (see attached explanatory Fig. A).

The overlying shifter type phase shift mask has shifter patterns formed over light-shielding patterns of film with a thickness. Therefore, the shifter layer has a thickness difference, causing a deviation in the phase difference produced

by the phase shifter. Consequently, the pattern transfer accuracy on the wafer is degraded.

Under these circumstances, the inspection apparatus of the present invention was developed.

Referring to applicants' specification, in the section "Background of the Invention", page 2, the edges of phase shifter forming regions of the transparent substrate engraving type phase shift mask are formed under the chromium patterns (light-shielding patterns), and the phase shifter is formed at a light transmitting portion of the mask.

For these reasons, all phase shifter defects cannot be detected by a conventional inspection method using transmitted light or a conventional inspection method in which both the front and back surfaces of a phase shift mask are illuminated with light and the reflected light and the transmitted light are compared with each other.

If an overlying shifter type phase shift mask is inspected from the shifter patterned side thereof by the inspection method shown in Fig. 22 of Ooki et al, cited by the Examiner, it is possible to detect simple shifter configuration defects and contaminations.

However, if the detection sensitivity is increased to detect variations in the shifter film thickness, shifter film thickness variations that are originally present in all the shifter patterns of the overlying shifter type phase shift mask will be detected. Therefore, the detection accuracy cannot be increased, and it is impossible to detect shifter phase difference defects.

Further, there is overlay displacement of the shifter edges formed over the light-shielding patterns (chromium patterns), and there is also a corner roundness difference between the shifter patterns. This causes pseudo defects to appear. Accordingly, the inspection sensitivity has to be reduced undesirably.

If the inspection of the existing transparent substrate engraving type phase shift mask is performed from the shifter patterned side of the mask, it is impossible to detect shifter defects hiding behind the light-shielding patterns.

Accordingly, a feature of the present invention as claimed by the applicants employs light for inspection applied to the phase shift mask from the side thereof opposite to the shifter patterned side thereof, and reflected light images are captured to perform inspection.

Tzu et al., which is the second reference relied on by the Examiner, proposes a method of inspecting a phase shifter mask (overlying shifter type) by using transmitted light with two optical systems for performing two-area comparison inspection with two optical lenses, wherein a phase difference correcting prism is inserted into one of the optical systems to correct a phase difference deviation between the right and left optical systems to perform comparison inspection. With this inspection system, an extreme phase difference deviation in the mask can be detected. However, the inspection of shifter film thickness variations present in all the shifter patterns of the overlying, shifter type phase shift mask is performed after the phase difference correction has been made.

Therefore, although omission of a shifter pattern or the like can be detected, it is impossible to detect a gently varying shifter defect, a subtle phase difference deviation, etc.

Further, Tzu et al has the same structure as that of the phase difference measuring device available from Lasertech, Japan.

Applicants have experienced, by carrying out phase difference measurement with this above-mentioned device, that phase difference measurement cannot accurately be performed unless the area of the light-transmitting portion is at least 2 μm square. Accordingly, it cannot be applied to present phase shift masks having fine patterns with a pattern size of 1 μm or less. Moreover, it is difficult to carry out measurement to judge the presence of a defect while moving the stage because the optical signal output level is low.

Further, the inspection method of Tzu et al is totally different in inspection system from applicants' claimed invention. That is, Tzu et al performs transmitted light inspection from the back of the mask and is therefore not concerned with and does not appreciate the claimed invention of the present application.

Further, the two-lens comparison system using transmitted light per se is a publicly known technique and hence unpatentable. A feature of applicants' invention resides in the two-lens and two-or-more-area comparison inspection invented on the assumption that illumination for inspection is applied to the phase shift mask from the transparent substrate side thereof,

which is opposite to the shifter patterned side thereof, and reflected light images are captured.

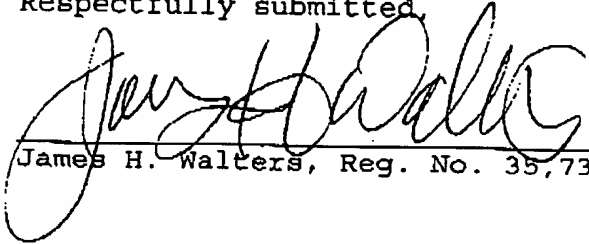
Applicants' claimed invention provides an inspection system with a simple optical structure wherein light is applied to a side of a phase shift mask opposite to a side thereof where patterns are formed, and image signals captured with the reflected light are compared with each other to perform inspection by utilizing an image signal difference due to a shifter configuration difference or a shifter fabrication depth difference.

The combination of patent documents relied on by the Examiner does not teach or suggest the claimed invention, whether considered alone or whether combined.

No amendment made was related to the statutory requirements of patentability unless expressly stated herein. No amendment made was for the purpose of narrowing the scope of any claim, unless applicants have argued herein that such amendment was made to distinguish over a particular reference or combination of references.

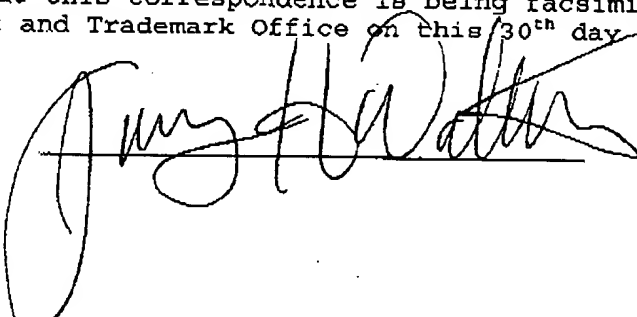
In light of the above noted amendments and remarks, this application is believed in condition for allowance and notice thereof is respectfully solicited. The Examiner is asked to contact applicants' attorney at 503-224-0115 if there are any questions.

Respectfully submitted,


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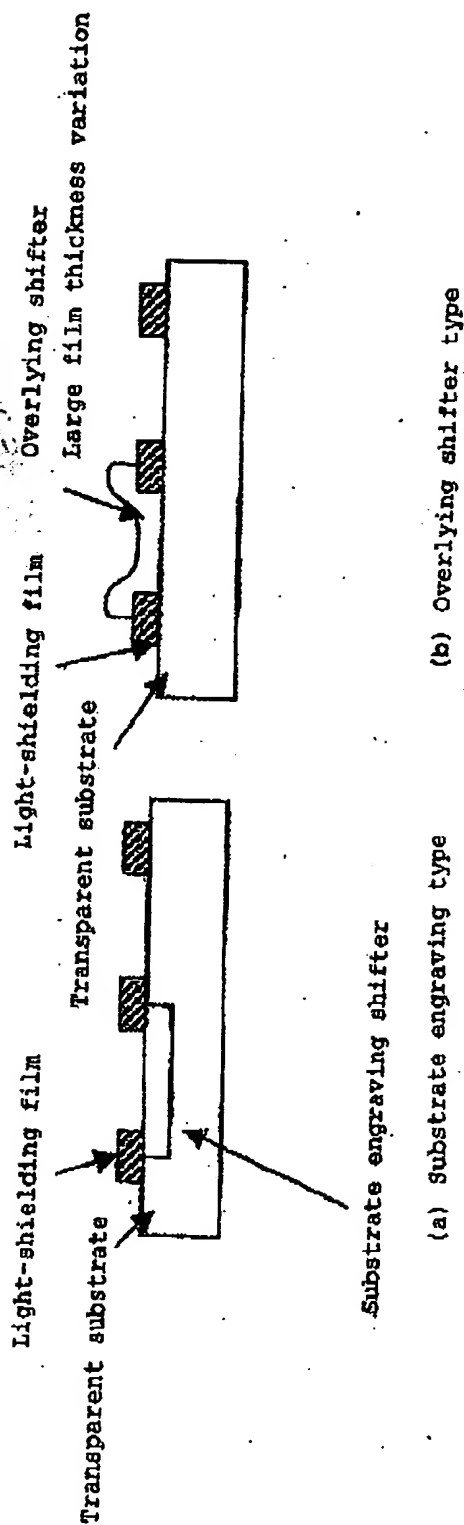
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EXPLANATORY FIG. A